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Indian Standard
FINENESS GRADES OF WOOL
(First Revision)

UDC 677·31 : 677·011 [620·168]

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FINENESS GRADES OF WOOL

(First Revision)

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Indian Standard
FINENESS GRADES OF WOOL
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 5 December 1977, after the draft finalized by the Wool and Wool Products Sectional Committee had been approved by the Textile Division Council.

0.2 This standard, which was published in 1970, has been revised to modify the specifications of indigenous wool in respect of average fibre diameter and the standard deviation. The confidence limit of the average fibre diameter has also been amended.

0.3 It is sometimes very difficult to correctly determine the fineness of wool on the basis of fibres taken out from the yarn/fabric which has undergone processing during spinning, weaving and finishing.

0.4 In the formulation of this standard assistance has been derived from ASTM Designation D 419-1976 'Specification for fineness of wool and assignment of grade', issued by the American Society for Testing and Materials.

0.5 Due to wide variation in the fineness parameters of imported wool and indigenous wool, the fineness values of these have been specified separately. Further, the grades finer than 48s have not been specified for indigenous wool as the same are not yet available on a commercial scale.

0.6 The terms 'grade' as used in this standard, should not be confused with the terms 'quality' and 'type'. 'Quality' is a term that includes not only fineness but also characteristics, such as length, character, strength, elasticity, luster and colour, all of which affect the spinnability of wool and the properties of the yarn and fabric produced from the wool. 'Type' is a term designating a particular combination of characteristics appropriate to a specific use of descriptive of geographic origin, breed of sheep or preparation for market. Further, the Bradford designations which use the same grade designations, for example, 54s and 50s, as are used in this standard, refer to the quality and not only to fineness.

0.7 To familiarize the industry with International System of Units (SI Units) the basic SI Units as well as the recommended SI Units for use in the textile industry are given in Appendix A.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the classification of fineness grades of the fibres in raw wool.

1.2 This standard is also applicable to wool yarns and fabrics processed on the woollen system. However, the test results obtained on the wool fibres removed from yarns and fabrics may not meet the specifications as given in the standard which are for raw wool. If these meet the specifications of the next coarser grade, the same shall be considered as satisfying the requirements.

2. TERMINOLOGY

2.1 For the purpose of this standard, 'grade' shall be a descriptive term used in rating of wool based on fineness, that is, average diameter and variation, that is, standard deviation of fibre diameter (or fibre width).

3. GRADES

3.1 The specifications for various grades of imported and indigenous wool are given in Table 1.

4. METHOD OF TEST

4.1 Determine the diameter of wool fibres by the method given in IS : 744-1977†. The number of observations to be made for this purpose shall be such as to obtain confidence limits of the mean within ± 1·0 μm at a probability level of 95 percent.

---

*Rules for rounding off numerical values (*revised*).

†Method for determination of wool fibre diameter — projection microscope method (*second revision*).

4.1.1 The number of fibres to be observed in order to attain the above stated confidence limits of the mean shall be determined by the following formula, which, however, shall not exceed 1 000:

$$n = \left(\frac{t\,\sigma}{E} \right)^2$$

where

n = number of fibres;

t = probability factor (1·96 for 95 percent probability level),

σ = standard deviation of fibre diameter; and

E = desired precision of the mean, that is, ± 1·0 μm.

NOTE — An example illustrating the calculation of the total number of observations, is given below:

On observing the diameter of 200 fibres, the standard deviation is found to be 14·25 microns. The number (n) of fibres to be tested shall be :

$$n = \left(\frac{1{\cdot}96 \times 14{\cdot}25}{1{\cdot}0} \right)^2 = 780$$

4.2 Calculate the average fibre diameter and standard deviation.

5. ASSIGNMENT OF GRADE

5.1 Compare the average fibre diameter and standard deviation in fibre diameter as determined in **4.2**, with the specifications for various grades given in Table 1. Assign to the wool the grade that corresponds to the observed average fibre diameter and standard deviation. If the measured average fibre diameter and standard deviation correspond to a single grade, assign that grade to the wool. If the standard deviation exceeds the maximum specified for the grade to which the observed average fibre diameter corresponds, assign to the wool the next coarser grade.

5.1.1 A few examples illustrating the assignment of grade are given below:

Imported Wool

Example 1

Average fibre diameter	24·24 μm
Standard deviation	6·21 μm
Assigned grade	60s

Example 2

Average fibre diameter	31·23 µm
Standard deviation	8·72 µm
Assigned grade	48s

Example 3

Average fibre diameter	31·23 µm
Standard deviation	9·30 µm
Assigned grade	46s

Indigenous Wool

Example 4

Average fibre diameter	34·15 µm
Standard deviation	13·12 µm
Assigned grade	48s

Example 5

Average fibre diameter	34·15 µm
Standard deviation	14·23 µm
Assigned grade	44s

Example 6

Average fibre diameter	37·23 µm
Standard deviation	15·91 µm
Assigned grade	40s

TABLE 1 SPECIFICATIONS FOR GRADES OF WOOL

(*Clauses* 3.1 *and* 5.1)

GRADE	IMPORTED WOOL		INDIGENOUS WOOL	
	Range for Average Fibre Diameter	Standard Deviation, *Max*	Range for Average Fibre Diameter	Standard Deviation, *Max*
(1)	(2)	(3)	(4)	(5)
	µm	µm	µm	µm
Finer than 80s	Under 17·70	3·59	—	—
80s	17·70 to 19·14	4·09	—	—
70s	19·15 ,, 20·59	4·59	—	—
64s	20·60 ,, 22·04	5·19	—	—
62s	22·05 ,, 23·49	5·89	—	—
60s	23·50 ,, 24·94	6·49	—	—
58s	24·95 ,, 26·39	7·09	—	—
56s	26·40 ,, 27·84	7·59	—	—
54s	27·85 ,, 29·29	8·19	—	—
50s	29·30 ,, 30·99	8·69	—	—
48s	31·00 ,, 32·69	9·09	Under 34·40	13·50
46s	32·70 ,, 34·39	9·59	—	—
44s	34·40 ,, 36·19	10·09	34·41 to 36·20	14·75
40s	36·20 ,, 38·09	10·69	36·21 ,, 38·60	16·25
36s	38·10 ,, 40·20	11·19	38·61 ,, 40·80	18·00
Coarser than 36s	Over 40·20	—	Over 40·81	—

APPENDIX A

(*Clause* 0.7)

SI UNITS

TABLE 2 INTERNATIONAL SYSTEM OF UNITS

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	CONVERSION
Force	newton	N	1 N = 0·101 972 kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

TABLE 3 RECOMMENDED SI UNITS FOR TEXTILES

SL No.	CHARACTERISTIC	SI UNIT		APPLICATION
		Unit	Abbreviation	
(1)	(2)	(3)	(4)	(5)
1.	Length	Millimetre	mm	Fibres
		Millimetre, centimetre	mm, cm	Samples and test specimens (as appropriate)
		Metre	m	Yarns, ropes and cordages, fabrics
2.	Width	Millimetre	mm	Narrow fabrics
		Centimetre	cm	Other fabrics
		Millimetre, centimetre	mm, cm	Samples and test specimen (as appropriate)
		Centimetre, metre	cm, m	Carpets, druggets, durries (as appropriate)
3.	Thickness	Micrometre (micron)	µm	Delicate fabrics
		Millimetre	mm	Other fabrics, carpets, felts
4.	Linear density	Tex	tex	Yarns
		Millitex	mtex	Fibres
		Decitex	dtex	Filament and filament yarns
		Kilotex	ktex	Slivers, ropes and cordages
5.	Diameter	Micrometre (micron)	µm	Fibres
		Millimetre	mm	Yarns, ropes, cordages
6.	Circumference	Millimetre	mm	Ropes, cordages
7.	Threads in cloth:			
	a) Length	Number per centimetre	ends/cm	Woven fabrics (as appropriate)
		Number per decimetre	ends/dm	
	b) Width	Number per centimetre	picks/cm	
		Number per decimetre	picks/dm	
8.	Warp threads in loom	Number per centimetre	ends/cm	Reeds
9.	Stitches in cloth:			
	a) Length	Number per centimetre	courses/cm	Knitted fabrics (as appropriate)
		Number per decimetre	courses/dm	
	b) Width	Number per centimetre	wales/cm	
		Number per decimetre	wales/dm	

(*Continued*)

TABLE 3 RECOMMENDED SI UNITS FOR TEXTILES — *Contd*

SL No.	CHARACTERISTIC	SI UNIT		APPLICATION
		Unit	Abbreviation	
(1)	(2)	(3)	(4)	(5)
10.	Stitch length	Millimetre	mm	Knitted fabrics Made-up fabrics
11.	Mass per unit area	Grams per square metre	g/m^2	Fabrics
12.	Mass per unit length	Grams per metre	g/m	Fabrics
13.	Twist	Turns per centimetre	turns/cm	Yarns, ropes (as appropriate)
		Turns per metre	turns/m	
14.	Test or gauge length	Millimetre, centimetre	mm, cm	Fibres, yarns and fabric specimens (as appropriate)
15.	Breaking load	Millinewton	mN	Fibres, delicate yarns (skeins or individual)
		Newton	N	Strong yarns (individual or skeins), ropes and cordages, fabrics
16.	Breaking length	Kilometre	km	Yarns
17.	Tenacity	Millinewton per tex	mN/tex	Fibres, yarns (individual or skeins)
18.	Twist factor or twist multiplier	Turns per centimetre × square root of tex	turns/cm × $\sqrt{tex}$	Yarns (as appropriate)
		Turns per metre × square root of tex	turns/m × $\sqrt{tex}$	
19.	Bursting strength	Newton per square centimetre	N/cm^2	Fabrics
20.	Tear strength	Millinewton	mN	Fabrics (as appropriate)
		Newton	N	
21.	Pile height	Millimetre	mm	Carpets
22.	Pile density	Mass of pile yarn in grams per square metre per millimetre pile height	g/m^2/mm pile height	Pile carpet
23.	Elastic modulus	Millinewton per tex per unit deformation	mN/tex/unit deformation	Fibres, yarns, strands

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Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

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TO
IS 5910 : 1977 FINENESS GRADES OF WOOL

(First Revision)

(*Page* 5, *clause* 5.1) — Substitute the following for the existing:

'5.1 Compare the average fibre diameter and standard deviation in fibre diameter as determined in 4.2, with the specifications for various grades given in Table 1. Assign to the wool the grade that corresponds to the observed average fibre diameter and standard deviation. If the measured average fibre diameter and standard deviation corresponds to a single grade, assign that grade to the wool. If the standard deviation exceeds by two grades lower than that specified for grade to which observed fibre diameter corresponds, assign to the wool the next coarser grade. In case the standard deviation further exceeds then no grade is to be assigned for having used hetrogeneous/improperly graded wool rendering the material unsuitable for the desired purpose.'

(TX 04)

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